

EARTH SCIENCE IN SECONDARY EDUCATION

GEO 319

Tentative Syllabus

DESCRIPTION

The course is designed to prepare you to teach Earth Science at the secondary level. During the semester we will review major content areas in Earth Science, build new and compile existing lessons and units in these areas, compile a variety of teaching resources, carry out a small research project and start down the path of being a professional science teacher. You will be required to write (several projects that total a large amount) accurately and concisely in both teaching and scientific formats. You will work in teams and as individuals. You will present your work orally and in writing. Since this will be a highly interactive course with a small number of upper-level students our success depends heavily on your individual commitment to the group.

OBJECTIVES

1. to increase your content knowledge about Earth Science,
2. to improve your skills in teaching science by inquiry,
3. to involve you in geologic research,
4. to provide you with teaching materials and resources,
5. to foster a professional work ethic, and
6. to make you proficient at addressing the Michigan Curriculum Framework standards and understanding the format of the Michigan Education Assessment Program.

PREREQUISITES

The course assumes the student has a working knowledge of basic earth science content, skills, and concepts. This background is gained from the required major and cognate courses: GEO 111 (materials, processes, plate tectonics), GEO 112 (plate tectonics, geologic time, earth history), GEO 211 (minerals), GEO 212 (petrology), PHY 105 (astronomy), NRM 140 or 281 (climate or soils) plus one biology or life science course.

COURSE WORK**Short Assignments**

1. 1-2 page activity interpreting published geologic data or graph(s)
2. 2-3 page activity using mathematics or statistics to describe some aspect of earth science
3. 2-3 page activity connecting earth science to contemporary, historical, technological, and societal issues
4. one weekly report of daily weather conditions that includes graphs, charts, data, and summary
5. one monthly report on the position of the Sun, Moon, and planets
6. 1-page description of a free teaching resource
7. write one constructive and one reflective question following the format of the MEAP
8. 1-2 page description of an Earth scientist and his/her contribution to the field
9. Reference list on some aspect of Michigan geology

Portfolio and Notes

You will learn, research, find, generate, and share a lot of information this semester. It behooves you to organize this material in a useful way. A 3 or 4 inch binder should be enough (it will hold the course pack plus handouts). You also need to take notes each class. Some nights these notes may be an outline of our activities BUT they need to include an observation of the key scientific concepts we cover.

Work with Local Teacher

Each student will be expected to spend a half-day with Chris Bolhuis, an earth science teacher at Hudsonville High School, or Mike Fenlon, a physical science teacher at Zeeland Middle School. You will be observing the teacher and his students and then helping him or presenting the lesson on your own. After your visit you need to write a two-three page summary of your visit that will include observations, outline of the lesson, success of the lesson, suggestions, and a reflective description of the experience.

Class Research Projects

The class will work as a group on a research or materials development project. The suggested research topic involves the 1904 flood of the Grand River. Potential materials development projects include designing and delivering a presentation at a future Michigan Science Teachers Association meeting. The work will also be presented at the GVSU Student Scholarship Day (Wed April 7). See details at <http://www.gvsu.edu/ssd/> for details.

Lesson Plan

Each student must develop an **ORIGINAL** Earth science lesson plan on a topic suggested by Steve or an approved topic (select by Feb 5). This lesson is the majority of your grade. To receive full credit your efforts must result in a paper ready to submit to a peer-reviewed journal (*MSTA Journal*, *NSTA Science Scope* or *The Science teacher*, *Journal of Geoscience Education*). Lesson plans will follow the constructivist model and consist of: a written one-page outline describing the lesson (due Feb 26); a draft version of the paper (due March 25); a completed written lesson plan (submitted on paper April 15 or 20), and an in-class 15 minute (abbreviated) presentation of the highlights of the lesson you developed. Samples of lesson plans are available in Steve's office. Your lessons should include line drawings, diagrams, or photos (as needed) that are in the public domain (i.e., not copyrighted). Links to web resources are welcome but must be complete. You will need to provide one copy of your completed lesson to each classmate. A handout that describes the scoring procedures will be provided. A sample of a unit plans is available at <http://faculty.gvsu.edu/mattoxs/glacier.html>.

GRADES Grades will be based on the following:

Work	Points
Short assignments (9 at 25 pts each)	225
Portfolio of semester's work	25
Fieldtrip	100
Work with local teacher	50
Completion of in-class work (20 at 10 points each)	200
Class research summary paper	100
Student Scholarship Day poster	50
Unit plan on a specific topic	250
Total	1000 points

Extra Credit (up to 50 points each for a total up to 100 points)

1. attend the annual MSTTA meeting in Lansing, March 4-6
2. assist and delivery a session at the Science Olympiad

Grading Scale

The following rubric will be applied to all work:

% of Points	Criteria
100	Outstanding work; all correct; explanations and justifications are in depth, thorough, and imaginative; creative, original.
80	Good explanations; minor errors, some information missing.
60	Good work but too many minor errors or one significant error; insufficient support or depth.
40	Some good work but significant error, omission, or flawed reasoning; lack of depth.
20	Minimal attempt with gross errors or trivial support.
10	Not developed, attempt at project shows no understanding; no attempt.

Course grades will be on a fixed scale of >93.3% = A, 90%-93.3% = A-, 89.9- >86.6 = B+, 86.6- >83.3 = B, 83.3-80% = B-, 79.9- >76.6 = C+, 76.6- >73.3 = C, 73.3-70% = C-, 69.9- >66.6 = D+, 66.6- >63.3 = D, <60% = F.

All work is due on the date agreed upon in class. There is a penalty of 50% of the points you earn **per day** that material is late. If you know something will be late contact Steve before the due date.

Significant Dates

Jan 20 data/graph assignment due
 Jan 27 math/stats assignment due
 Feb 5 deadline to select paper topic
 Feb 10 connecting Earth Science assignment due
 Feb 26 outline of paper due
 March 11 Michigan geology reference list due
 March 18 describe scientist assignment due
 March 25 draft paper due
 April 1 free teaching resource due
 April 15 or 20 final paper due

TENATIVE COURSE SCHEDULE

Week	Dates	Topics	Readings
1	Jan 6	Intro to course, expectations, constructivism (5E), standards, and library tour.	Chapter 14, Science Standards
		ASTRONOMY	NSTA Astronomy
1	8	Life in the Universe	TERC, A7, A9
2	13, 15	Stars Changes in the Day/Night Sky	TERC A1, A11, A10
3	20, 22	Structure and Scale of the Universe	A2, A3, A4, A5, A6
4	27	Telescopes and Constellations	
		WEATHER AND CLIMATE	NSTA Meteorology
4	29	Characteristics of the Atmosphere	A8 (astro), A2, A3, A4, A5, A6, A8
5	Feb 3, 5	Water cycle Weather Patterns	A10, A11 A1, A9, A12-A18
6	10, 12	Severe Weather Climate and Climate Change	A19 A7
		HYDROSPHERE	
7	17, 19	Topographic Maps Watersheds	course pack, USGS topo maps USGS sites
8	24, 26	Groundwater Surface water	USGS sites USGS topo maps, Steve's guide
9	Mar 2,4	Spring Break	
9	4-6	MSTA meeting in Lansing	
		GEOSPHERE	
10	9, 11	Age and Geologic History of the Earth	course pack
11	16, 18	Geologic Materials	course pack
12	23, 25	Michigan Geology: glacial, coasts	satellite image, Quat. map, Steve's guide
	27	Saturday, Science Olympiad at GVSU	
13	30, Apr 1	Earthquakes Volcanoes	Virtual Earthquake Smithsonian CD, USGS
14	6, 7 8	Plate Tectonics (global features) Student Scholarship Day Plate Tectonics (phenomena and evidence)	Dynamic Planet map
15	13, 15	Plate Tectonics Student presentations	
16	20	Student presentations (Finals Week)	Work on poster presentations

**Weekly report of daily weather conditions that includes graphs, charts, data, and summary.
Sign up sheet. Pick a week to report on.**

Week	Dates	
1	Jan 6, 8	
2	13, 15	
3	20, 22	
4	27, 29	
5	Feb 3, 5	
6	10, 12	
7	17, 19	
8	24, 26	
9	Mar 2, 4	
10	9, 11	
11	16, 18	
12	23, 25	
13	30, Apr 1	
14	6, 8	
15	13, 15	

Monthly report on the position of the Sun, Moon, and planets that includes graphs, charts, data, and summary. Sign up sheet. Pick a month to report on.

January	1. 2. 3. 4. 5.
February	1. 2. 3. 4. 5.
March	1. 2. 3. 4. 5.
April	1. 2. 3. 4. 5.